

SUPPORT FOR THE AMENDMENTS

Claim 6 is amended to recite the description of Claims 14 and 16.

Claims 14 and 16 are canceled.

No new matter is added to this application by this request for reconsideration.

Claims 6-9, 11-12, 15, and 17-20 are active.

REMARKS/ARGUMENTS

The presently claimed invention is directed to an asymmetric anthracene derivative as described in Claim 6 and an organic electroluminescence device which comprises a cathode, an anode and a light emitting layer disposed between the cathode and anode which comprises the described asymmetric anthracene derivative.

Applicants respectfully note that Claim 6 is herein amended to recite the description of Claims 14 and 16. Upon entry of this amendment, the present invention provides asymmetric anthracene derivatives according to formula (2) containing the specific condensed aromatic groups listed in Claim 6.

The rejection of Claims 6, 7 and 14-19 under 35 U.S.C. 102(b) or in the alternative, under 35 U.S.C. 103(a) over Shi et al. (EP 1,009,044) is respectfully traversed.

The Office has cited formulae (I), (VI), (VII), (X) and (XI) from Shi, to show anthracene derivatives according to the present invention. Applicants note that in description of these formulae, Shi indicates that R<sup>3</sup> and R<sup>4</sup> are individually hydrogen, alkyl of from 1 to 24 carbon atoms, aryl or substituted aryl of from 5 to 20 carbon atoms, heteroaryl or substituted heteroaryl, halogen or cyano. Nowhere does this reference disclose the asymmetric anthracene derivative as presently described in Claim 6 where Ar is a condensed

aromatic group selected from the group listed, and Ar' is a condensed aromatic group selected from the group listed.

Applicants respectfully submit that a proper finding of anticipation requires that "[e]very element of the claimed invention ... be literally present, arranged as in the claim. *Perkin-Elmer Corp.*, 732 F.2d at 894, 221 USPQ at 673; *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 771-72, 218 USPQ 781, 789 (Fed. Cir. 1983), *cert. denied*, 465 U.S. 1026 [224 USPQ 520] (1984). The identical invention must be described in as complete detail in the reference as is described in the claimed invention.

Therefore, Applicants respectfully submit that the cited reference cannot anticipate the presently claimed invention because the reference does not at all, describe an asymmetric anthracene derivative as presently described in Claim 6.

Moreover, the Office has pointed to Shi structures 47, 48, 50, 51, 52, 54, 55, 56 and 57. Careful review of these structures indicates that in every case the phenyl ring is symmetrically 3,5-disubstituted and nowhere is a mono-substituted phenyl according to the present invention described.

In discussion of "**Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.***" the Office has stated:

"The rationale to support a conclusion that the claim would have been obvious is that **all the claimed elements were known in the prior art** and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art at the time of the invention. "[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." **If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art,**" (Federal Register, Vol. 72, No. 195, page 57529) (Bold added) (Citations omitted)

Applicants submit that as described above, Shi does not make all the elements of the presently claimed invention known. Moreover, no where does the cited reference suggest or provide motivation that would have spurred one of ordinary skill in the art, at the time of the present invention, to look to an asymmetric structure according to Claim 6 of the present invention. Therefore, the cited reference cannot render the claimed invention obvious.

In view of all the above, Applicants submit that the cited reference can neither anticipate nor render the claimed invention obvious and respectfully request that the rejection of Claims 6, 7 and 14-19 under 35 U.S.C. 102(b) or in the alternative, under 35 U.S.C. 103(a) over Shi be withdrawn.

The rejection of Claims 8, 9, and 11 under 35 U.S.C. 103(a) over Shi (EP 1,009,044) in view of Shi et al.(US 5,935,721) and Shi et al. (U.S. 5,972,247) is respectfully traversed.

Applicants have described the deficiencies of the primary reference above.

Both Shi ('721) and Shi ('247) describe anthracene compounds with **symmetric** 9,10 substitution.

Shi '247 describes (Col. 2, lines 60-67):

In 9,10-bis(3'5'-diaryl)phenyl anthracene molecule, it would exist a series of non-interconverting atropisomers due to the existence of the two phenyl-anthracene and four phenyl-aryl groups which have large energy barriers to internal rotation. It suggests the presence of polymeric forms in solid form among this class of compounds. As a result, the film forming property of 9,10-bis(3',5'-diaryl)phenyl anthracene is very good.

Accordingly, Applicants respectfully submit that Shi '247 teaches the need of the symmetric structure both references claim.

The Office has acknowledged that Shi (EP) does not teach the compounds it describes as light emitting materials and incorrectly alleges that Shi (EP) teaches anthracene derivatives as used in a light emitting layer (Official Action dated June 24, 2008, page 5, last paragraph).

Applicants respectfully point out that [0003] describes only anthracene itself and no derivative thereof. Other fused ring structures are listed; however, these are not anthracene derivatives as described in the present invention.

Moreover, neither Shi ('721) nor Shi ('247) discloses or suggests a structure according to Claim 6, wherein only one aromatic substituent is present on the phenyl ring.

Applicants again submit that the 9,10 asymmetric di-substituted anthracene compounds according to the claimed invention have significantly improved operational half lives as emissive materials in an EL device in comparison to symmetric di-substituted anthracene compounds. The data for Examples 5, 6, 7, 8, 14 and 15 according to the claimed invention and Comparative Examples 1 and 2 is again shown in the following Table.

Table

| Example No. | Structure | Efficiency (cd/A) | Half life (hours) |
|-------------|-----------|-------------------|-------------------|
| 5           | AN 8      | 11.2              | 4200              |
| 6           | AN 10     | 11.0              | 4,000             |
| 7           | AN 28     | 10.9              | 3,700             |
| 8           | AN 30     | 10.8              | 3,700             |
| 9           | AN 8      | 10.6              | 3,200             |
| 13          | AN 5      | 11.0              | 2,200             |
| 14          | AN 7      | 11.3              | 4,500             |
| 15          | AN 49     | 11.3              | 4,500             |
| Comp. 1     | an 1      | 9.0               | 2,200             |
| Comp. 2     | An 2      | 8.8               | 1,100             |

As indicated in the above Table, the EL devices prepared with the 9,10 asymmetric di-substituted anthracene compounds according to the claimed invention show significantly improved light emission efficiency and generally have half lives which are significantly longer than the symmetric structures of the comparative examples. Such improved performance is nowhere disclosed or suggested in any of the cited references.

With regard to the above showing of significant improvement, the Office states that (Official Action dated June 24, 2008, page 12, lines 6-8):

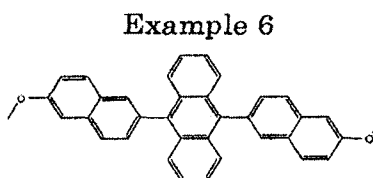
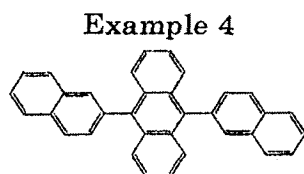
This is not found persuasive in that the effect of substituents upon either a symmetric or asymmetric 9,10 diaryl substituted anthracene derivative results in improved device performance as indicated in the prior art of record.

Applicants respectfully disagree and request the Examiner's consideration of the following.

The Examiner indicates that (Official Action dated June 24, 2008, page 12, lines 8-11):

For instance, Shi '721 teaches 9,10-dinaphthyl anthracene derivatives. Example 6 of Shi '721 teaches further substitution of dinaphthyl anthracene results in improved performance over unsubstituted dinaphthyl anthracene such as in example 4. Shi '721 also teaches aryl substituents on the dinaphthyl anthracene skeleton.

Applicants respectfully note that the following compounds are used in Examples 4 and 6 of Shi '721.



Both the compounds are symmetrical. Therefore, the knowledge obtained from the comparison of Examples 4 and 6 is that a symmetric compound derived by introducing

substituents into two naphthyl groups of an unsubstituted symmetric dinaphthyl anthracene shows an improved performance.

In contrast, the presently claimed invention recites compounds having (1) an asymmetric structure wherein a condensed aromatic group is bonded at one of 9- and 10-positions of the anthracene structure and a phenyl group is bonded to the other position and (2) an aryl group is bonded to the phenyl group.

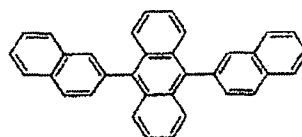
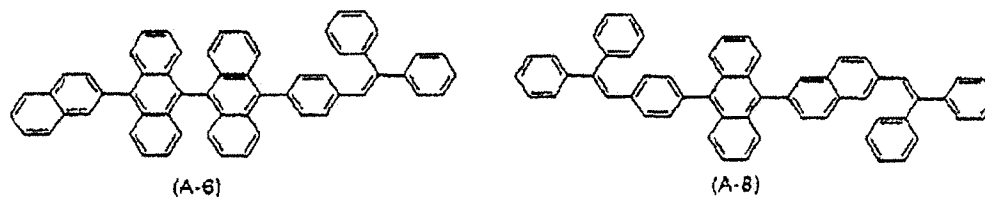
The compounds of Example 6 of Shi '721 does not read on the structural description of the claimed invention, i.e., an asymmetric structure with a phenyl group bonded at one of 9- and 10-positions of the anthracene structure, and an aryl group bonded to the phenyl group.

Applicants submit that the results obtained by the comparison between the compounds of Shi '721 which are structurally quite different from the claimed compounds are irrelevant to the present invention.

The Examiner further stated that (Official Action dated June 24, 2008, page 12, lines 11-17):

Similarly, Ikeda teaches 9,10 diary/ substituted anthracene derivatives. The 9,10 aryl substituents can be asymmetric with naphthyl and phenyl used in the example compounds, such as (A-6) and (A-8) which are shown in paragraph [0037]. Ikeda compares the performance of the anthracene derivatives to 9,10-dinaphthyl anthracene in the examples of table 1, paragraph [0128]. Comparative example 2, of table 1, uses dinaphthyl anthracene in the light emitting layer, Example 12, of table 1, uses compound (A-6) in the light emitting layer.

The compounds (A-6) and (A-8) and the compound used in Comparative Example 2 of Ikeda are as follows.

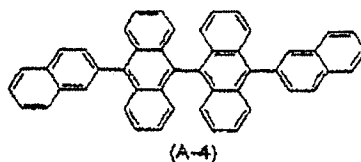


Comparative Example 2

The Examiner compares Comparative Example 2 with Example 12 in which the compound (A-6) is used. Applicants submit that as can be seen from the above chemical structures, the central structure of the compound (A-6) is a bisanthracene structure, whereas the compound of Comparative Example 2 is a monoanthracene structure.

In addition., the compound of Comparative Example 2 does not have a phenyl group on the anthracene structure. Applicants respectfully submit that one of ordinary skill in the art would recognize that the effects of compounds which are structurally different as shown above, cannot be directly compared. In addition, the substituent on the phenyl group of the compound (A-6) is diphenylvinyl group. Therefore, Example 12 are structurally different from the presently claimed invention where an aryl group is attached to the phenyl group.

In Example 10 of Ikeda, the following compound (A-4) is used.

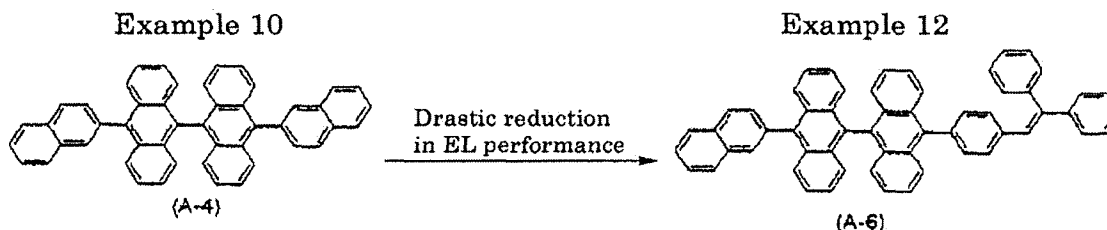


In place of the compound of comparative example 2, the compound (A-4) should be compared with the compound (A-6) because both have bisanthracene central structure.

The results of Examples 10 and 12 are reproduced below.

|            | Voltage (V) | Luminance (nit) | Efficiency<br>(lumen/w) | Half lifetime<br>(hr) |
|------------|-------------|-----------------|-------------------------|-----------------------|
| Example 10 | 6.0         | 387             | 4.20                    | 2500                  |
| Example 12 | 6.0         | 173             | 3.15                    | 1700                  |

Ikeda teaches that the EL performance is drastically reduced when the compound (A-6) is used in place of the compound (A-4).



Thus, Ikeda teaches that the EL performance is drastically reduced when:

- (1) a phenyl group is substituted for one of two naphthyl group of the compound (A-4), thereby making the compound asymmetric; and then
- (2) a substituent is introduced into the phenyl group.

Clearly, what is taught by Ikeda et al. is contrary to the Examiner's view. From the foregoing, the Examiner's indication that (Official Action dated June 24, 2008, page 12, last sentence):

In both Shi '721 and Ikeda the references provide data that indicate improved performance of 9,10 diaryl substituted anthracene derivatives having further substituents upon the aryl groups when compared to 9,10- dinaphthyl anthracene.

is quite incorrect. Therefore, Applicants respectfully submit that the Office has not rebutted Applicants showing of significant performance improvement.

In view of the above, Applicants respectfully submit that the cited combination of references cannot render the claimed invention obvious and withdrawal of the rejection of Claims 8, 9, and 11 under 35 U.S.C. 103(a) over Shi (EP 1,009,044) in view of Shi et al. (US 5,935,721) and Shi et al. (U.S. 5,972,247) is respectfully requested.



The rejection of Claim 12 under 35 U.S.C. 103(a) over Shi (EP 1,009,044) in view of Shi ('721) and Shi ('247) and further in view of Ikeda et al. (JP 2001-097897) is respectfully traversed.

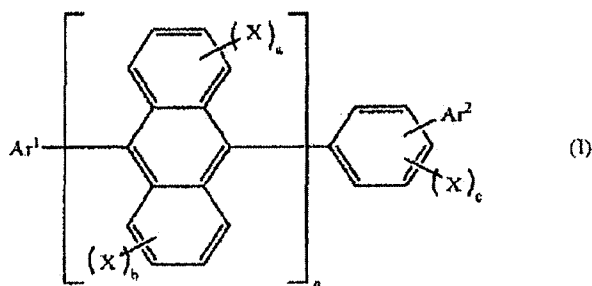
Claim 12 depends indirectly from Claim 6 and therefore includes all the description of the independent claim. Applicants have described the deficiencies of the primary reference combination relative to rendering the presently claimed invention obvious in the previous paragraphs.

Ikeda is cited to show use of a styryl amine in an EL device. However, Applicants respectfully submit that as described in the above paragraphs, Ikeda does not disclose or suggest an asymmetric anthracene derivative according to the presently claimed invention as a light emitting material and therefore, the cited reference combination does not disclose or suggest the presently claimed invention.

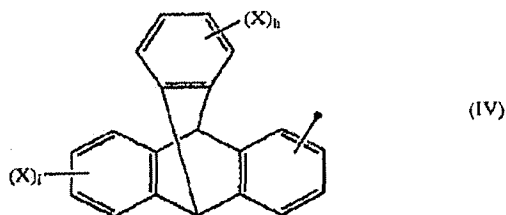
Accordingly, in view of the above discussion, Applicants respectfully submit that the combination of the cited references cannot render the claimed invention obvious, and withdrawal of the rejection of Claim 12 under 35 U.S.C. 103(a) over Shi (EP 1,009,044) in view of Shi ('721) and Shi ('247) and further in view of Ikeda et al. is respectfully requested.

The rejection of Claims 6-9, 11-12, 14-15 and 17-19 on the ground of nonstatutory obviousness-type double patenting over Claims 1-6 and 8 of U.S. 7,504,526 is respectfully traversed.

U.S. Patent No. 7,504,526 describes an anthracene derivative having formula (I):



wherein at least one of Ar<sup>1</sup> or Ar<sup>2</sup> is a **triptycenyl group** represented by the following formula (IV):

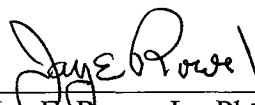


In contrast, the presently claimed anthracene derivatives do not have a triptycyl group. Accordingly, Applicants submit that there is no double patenting between the claimed invention and the claims of U.S. Patent No. 7,504,526, and respectfully request that the rejection be withdrawn.

Applicants respectfully submit that the above-identified application is now in condition for allowance and early notice of such action is earnestly solicited.

Respectfully submitted,

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